Profile Projector
PJ/PV/PH Series

Catalog No. E14005

Mitutoyo

PJ-H30 Series

Projector PJ-203
(Produced in 1958)

Projector PJ/PV/PH Series

Each Mitutoyo profile projector is a measuring machine that performs measurement, inspection and observation efficiently by projecting an image of a test workpiece on the stage onto a viewing screen under accurate magnification.
The inherently non-contact measurement method of profile projectors makes this type of instrument highly suitable for measuring small parts that are unmeasurable with general-purpose contact instruments or easily deformed plastic parts, and can also be used to observe the surface profiles of workpieces or inspect minute assemblies with surface illumination. Additionally, a wide selection of accessories allows advanced measurement and inspection of various workpieces.

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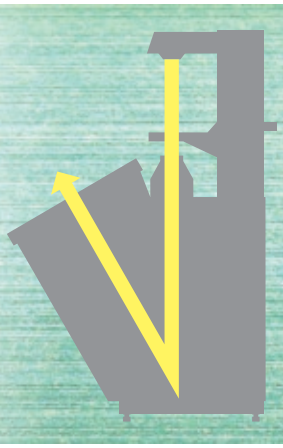
PJ Series

Screen diameter
300mm

- Applicable to a wide range of workpiece size
- Operations concentrated at the front of the instrument
- An extensive choice of workstages

PJ-A3000
P4 - 5

PJ-H30
P6 - 7



PV Series

Screen diameter
500mm

- Optimal for measurement compared with an enlarged drawing or tracing of a projection image on the screen
- Clock components, electronic parts, precious metal parts, precision parts, etc.

PV-5110
P8 - 9

PH Series

Screen diameter
350mm

- Observation/measurement of cutting tools (end mills, lathe tools, tipped saws, etc.)
- Cylindrical form (screws, springs, etc.)
- Horizontal-beam design means easy workpiece loading/unloading coupled with high weight-carrying capacity of glassless stage.

PH-3515F, PH-A14
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Stages
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PJ-A3000

High cost performance and high degree of operability
Stage-size selectable standard model with a screen diameter of 300mm
Built-in digital counter in the large character display specification

PJ-A3010F-200

Technical Data

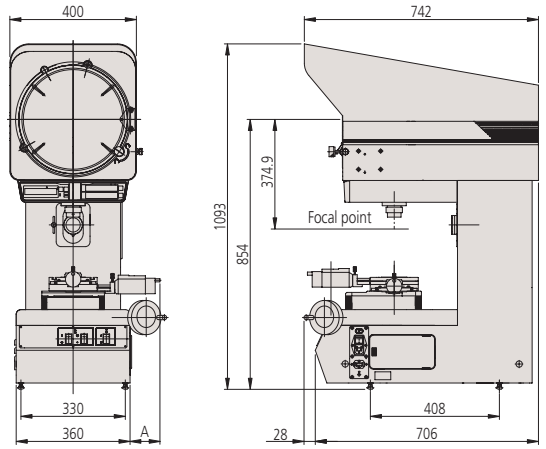
Projected image:	Inverted
Protractor screen	
• Effective diameter:	315mm (12.4")
• Screen material:	Fine-ground glass
• Screen rotation:	±360°, The counter displays up to ±370°.
• Angle reading:	Digital counter (LED), Resolution: 1′ or 0.01° (switchable) Range: ±370°, ABS/INC mode switching, Zero Set
• Cross hairs:	90° Solid lines
Projection lens:	10X (Standard accessory) Optional: 20X, 50X, 100X External half-reflecting mirror for surface illumination (only for 10x, 20x).
Lens mount:	Bayonet mount
Magnification accuracy	
• Contour illumination:	±0.1% or less
• Surface illumination:	±0.15% or less
Maximum workpiece height:	Refer to the projection lenses (H) right.
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Telecentric
• Functions:	2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Vertical illumination with adjustable condenser lens
• Functions:	Heat-absorbing filter, Cooling fan
Resolution for X/Y counter:	0.001mm or .0001"/0.001mm (.00005"/0.001mm: digital head)
Power supply:	100 - 240V AC, 50/60Hz, power cord (2m)
Mass:	105kg - 140kg
Power consumption:	Approx. 400W

Main unit side panel

Slide mechanism for replacing the tungsten-halogen lamp

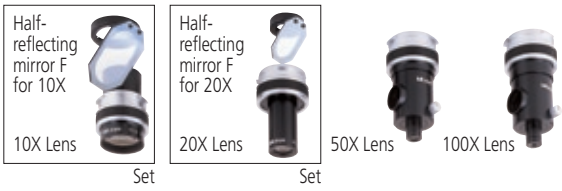
Dimensions

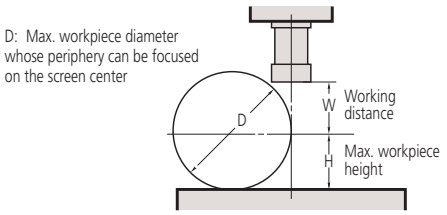
(Unit: mm)



A: 95mm (3.74") —— **PJ-A3005D-50**
67mm (2.64") —— **PJ-A3010F-100**
86mm (3.39") —— **PJ-A3005F-150**
233mm (9.17") —— **PJ-A3010F-200**

Projection lenses (10X is a standard accessory)





Unit: mm

	Magnification			
	10X	20X	50X	100X
View field	ø31.5	ø15.7	ø6.3	ø3.1
W	66 (20)	32.5 (2)	12.6	5
H -50 models*	123.5	123.5	123.5	123.5
-100 models	91	91	91	91
-150 models	103.5	103.5	103.5	103.5
200 models	92.5	92.5	92.5	92.5
D -50 models*	224 (198)	87 (61)	27	10
-100 models	182	87 (61)	27	10
-150 models	207 (198)	87 (61)	27	10
200 models	185	87 (61)	27	10

( ): When using surface illumination

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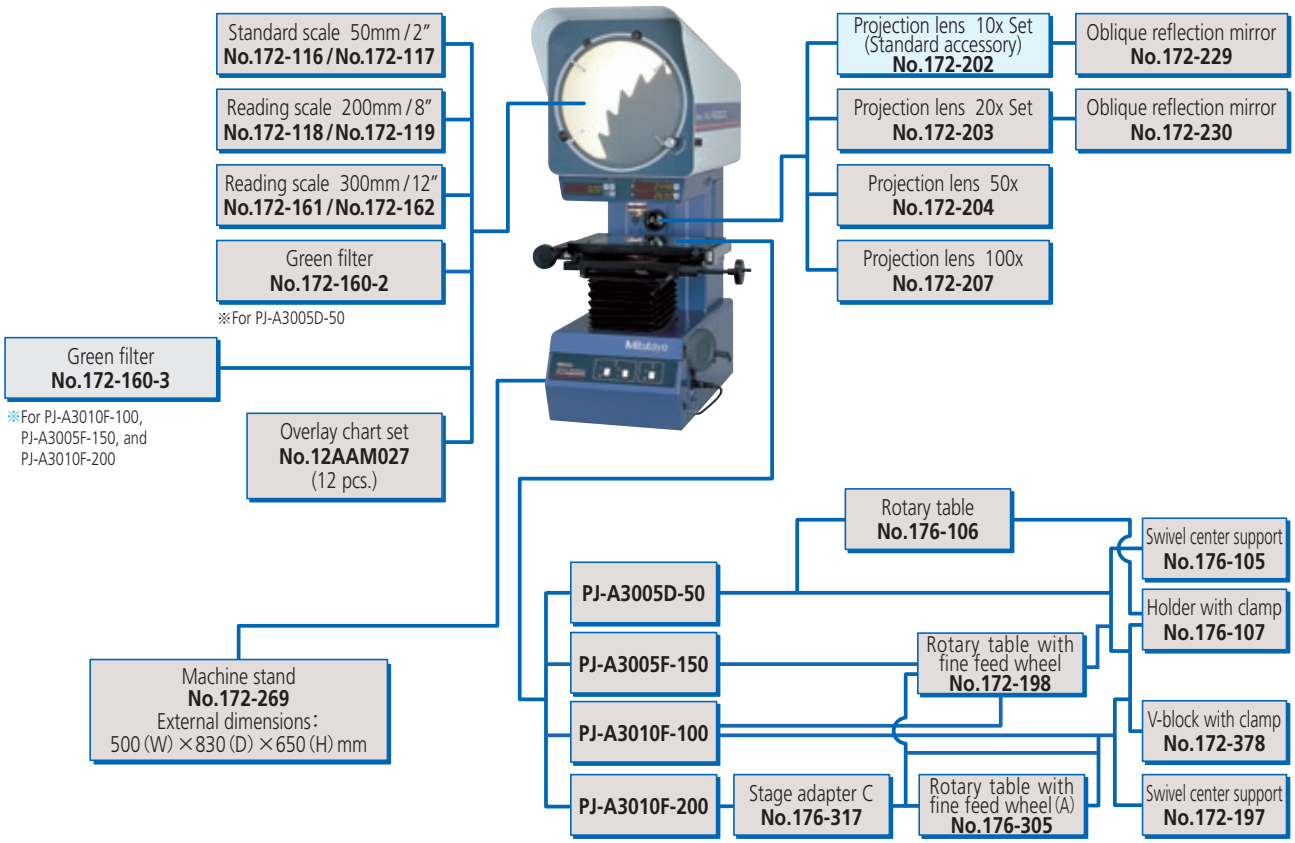
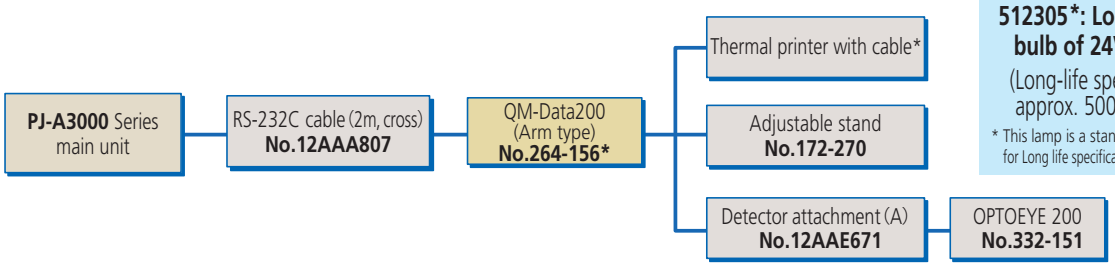
System Diagram



Note: If an optional unit is installed on the stage, the H (Max. workpiece height) length is reduced by the optional unit height.

Data Processing System Diagram



For details, refer to the QM-Data200 and Vision Unit brochure.

*Order numbers differ depending on the connector form.

◆Lamp replacement

515530: High-luminance halogen bulb of 24V/150W

512305*: Long-life halogen bulb of 24V/150W

(Long-life specification, Rating approx. 500 hours)

* This lamp is a standard accessory. Illuminance for Long life specification is rather low.

PJ-H30

•Design patent pending in Japan

Powerful PJ-series machine with the ultimate bright and crisp projection image.
Equipped with a high-rigidity main unit and linear scales, this series achieves high-accuracy measurement.
A total of 8 models are available including one equipped with the long-stroke stage of 300 x 179mm.
Provided with quick-release wheels for smooth and rapid operation of the stage.
Standard-equipped turret changes the projection lens smoothly and efficiently.

PJ-H30A2017B

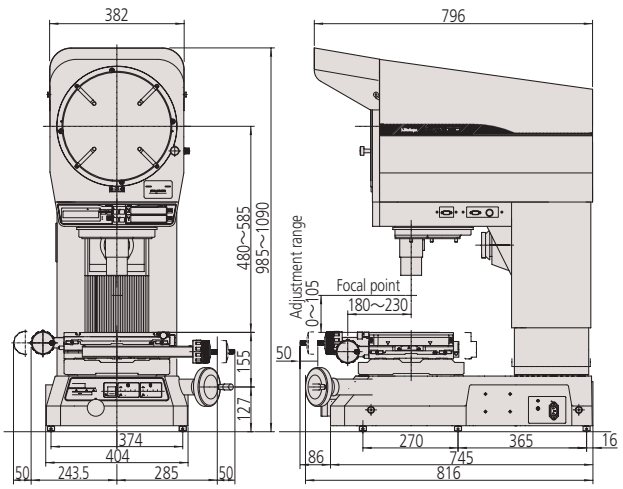
Technical Data

Projected image:	Erect
Protractor screen	
• Effective diameter:	306mm (12")
• Screen material:	Fine-ground glass
• Screen rotation:	±360°, The counter displays up to ±370°.
• Angle Reading:	Digital counter (LED) Resolution: 1′ or 0.01°(switchable) Range: ±370° ABS/INC mode switching, Zero Set
• Cross hairs:	Solid lines
Projection lens:	10X (Standard accessory) Optional: 5X, 20X, 50X, 100X Half-reflecting mirror for surface illumination Parfocal lens
Lens mount:	3-mount turret, Bayonet mount
Magnification accuracy	
• Contour illumination:	±0.1% or less
• Surface illumination:	±0.15% or less
Maximum workpiece height: 105mm (when rotary table is not equipped).	
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Zoom Telecentric
• Functions:	Non-stepped brightness adjustment, Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Vertical / oblique illumination with an adjustable condenser lens
• Functions:	Non-stepped brightness adjustment, Heat-absorbing filter, Cooling fan
Focusing:	Projection screen head driving PJ-H30A(manual), PJ-H30D(power drive)
Resolution for X/Y counter: 0.001mm or .0001"/0.001mm	
Power supply:	ON/OFF switch, 100 - 240V AC, GND terminal, 50/60Hz, power cord (2m)
Mass:	176kg - 212kg
Power consumption:	Approx. 420W

Main unit side panel

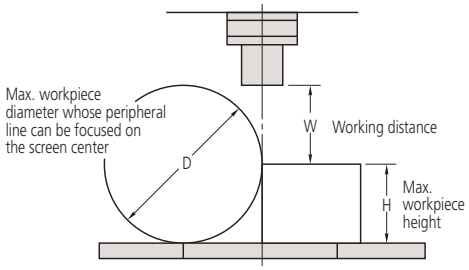
Dimensions

(Unit:mm)



Projection lenses (10X is a standard accessory)

5X Lens　10X Lens　20X Lens　50X Lens　100X Lens



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø61.2	ø30.6	ø15.3	ø6.12	ø3.06
H	105	105	105	105	105
W	66	70.5	56.5	50	50
D	148	197	137	114	114

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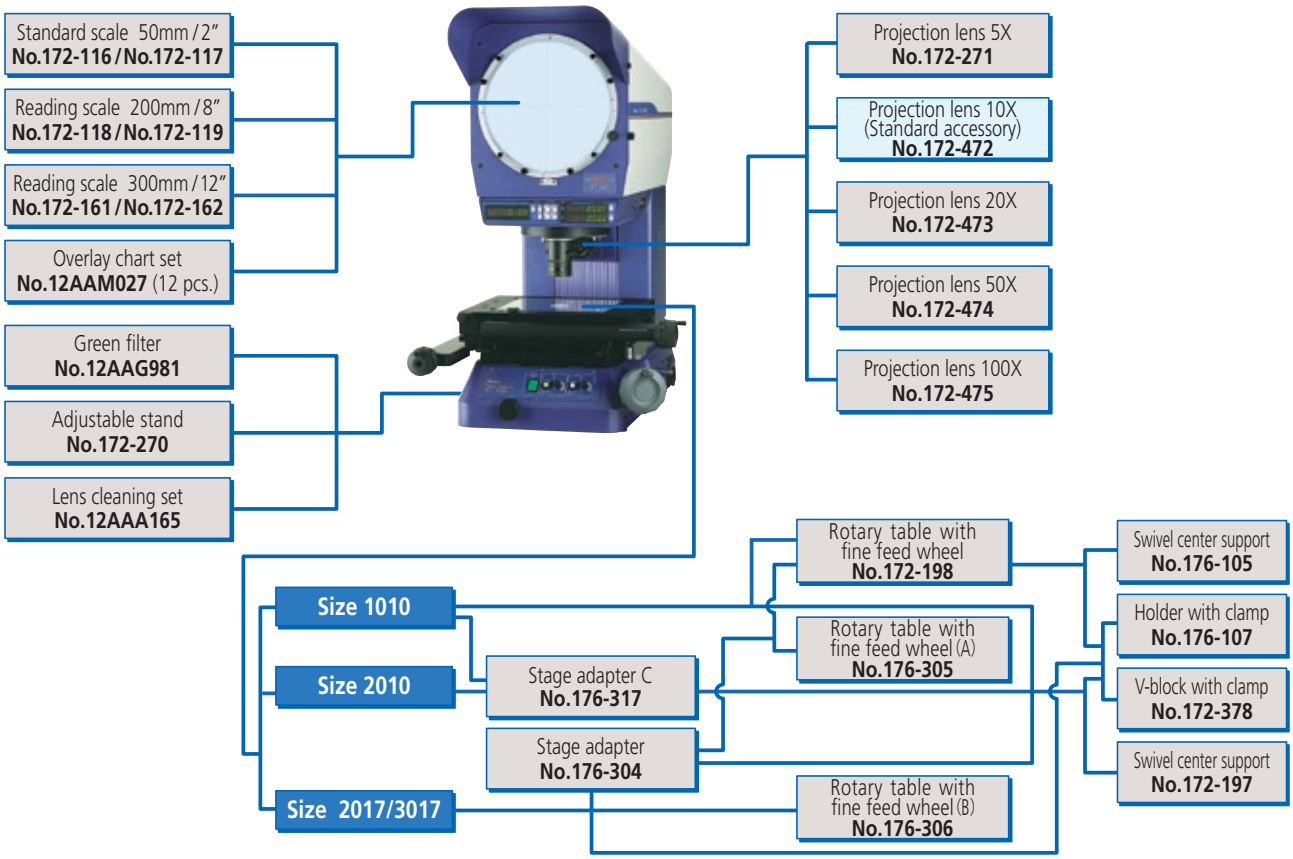
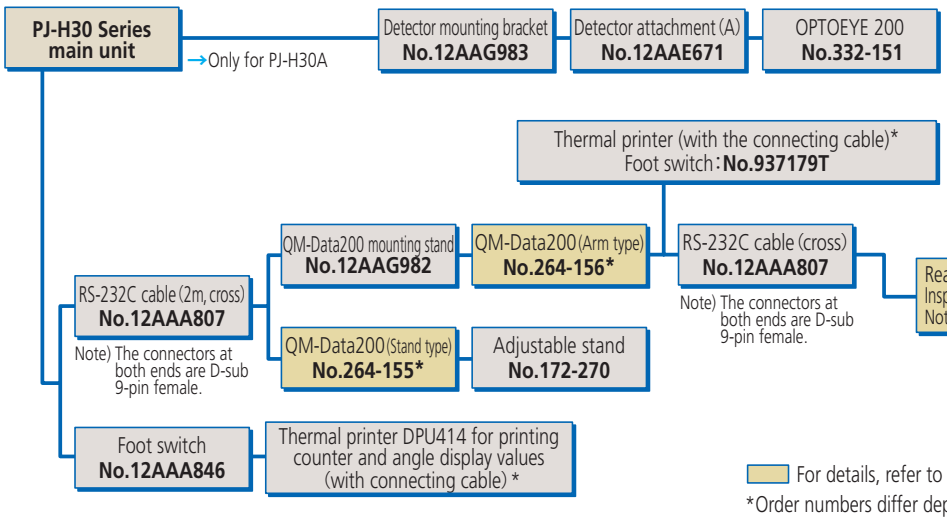
System Diagram



Note: If an optional unit is installed on the stage, the H (Max. workpiece height) length is reduced by the optional unit height.

Data Processing System Diagram



For details, refer to the QM-Data200 and Vision Unit brochure.
*Order numbers differ depending on the connector form.

◆Lamp replacement

515530*1: High-luminance halogen bulb of 24V/150W

512305*2: Long-life halogen bulb of 24V/150W

(Long-life specification, Rating approx. 500 hours)

*1 This lamp is a standard accessory.
*2 Illuminance for Long life specification is rather low.

PV-5110

Optimal for comparative inspection such as tracing of a projected image or observation of a contour with the 500mm forward-tilted screen.
This model supports improvement in efficiency of the inspection of mass-production precision parts.

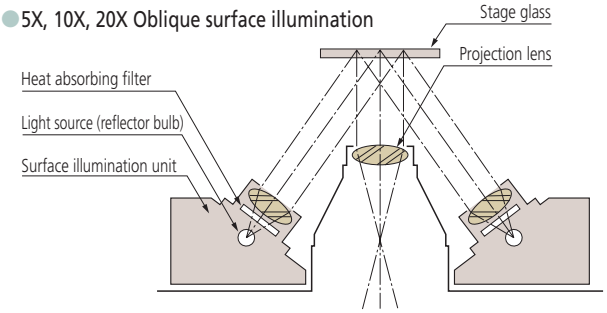
PV-5110

Technical Data

Projected image:	Inverted
Protractor screen	
• Effective diameter:	508mm (20″)
• Screen material:	Fine-ground glass
• Screen rotation:	±360°, The counter displays up to ±370°.
• Angle reading:	Digital counter (LED) Resolution: 1′ or 0.01° (switchable) Range: ±370° ABS/INC mode switching, Zero Set
• Cross hairs:	90° Solid lines
• 0 Line (Index):	Built-in, With a LED back light
Projection lens:	10X (Standard accessory) Optional: 5X, 20X, 50X, 100X
Lens mount:	Insert type mount
Magnification accuracy	
• Contour illumination:	±0.1% or less
• Surface illumination:	±0.15% or less
Maximum workpiece height:	Refer to the projection lenses (H) right.
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Zoom Telecentric
• Functions:	2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Vertical illumination
• Functions:	Adjustable condenser lens, Oblique illumination (for 5X, 10X and 20X), Heat-absorbing filter, Cooling fan
Focusing:	Stage part drive, Manual
Resolution for X/Y counter:	0.001mm or .0001″/0.001mm (using optional KA counter)
Power supply:	100 - 240V AC, 50/60Hz, power cord (2m)
Mass:	190kg
Power consumption:	Approx. 500W

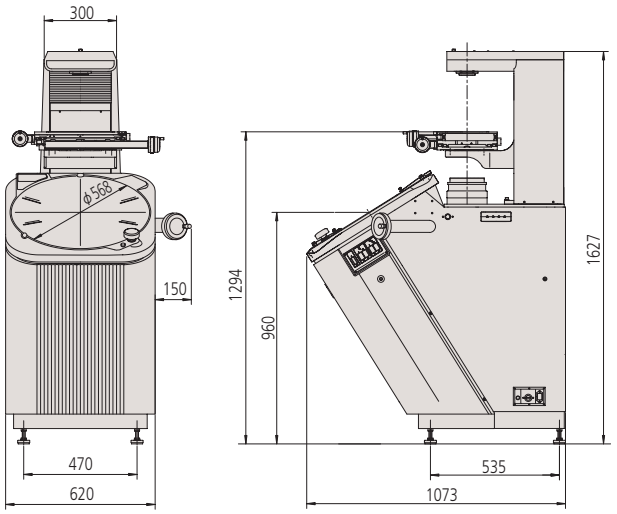
Note) X and Y counters are not built into the PV-5110 main unit. If a counter display is required, it is recommended that a QM-Data200 or KA-12 is purchased separately

● 5X, 10X, 20X Oblique surface illumination



Dimensions

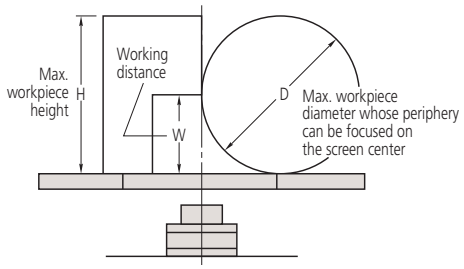
(Unit: mm)



To mount the counter (KA-12) and counter stand, approximately 300mm space is required on the right-hand side of the main unit.

Projection lenses (10X is a standard accessory)

5X Lens set | 10X Lens set | 20X Lens set | 50X Lens set | 100X Lens set



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø101.6	ø50.8	ø25.4	ø10.16	ø5.08
H	125	181	206	87	87
W	60 (27)	60	60	32.4	22.5
D	120	120	120	64.8	45

( ): When using surface illumination

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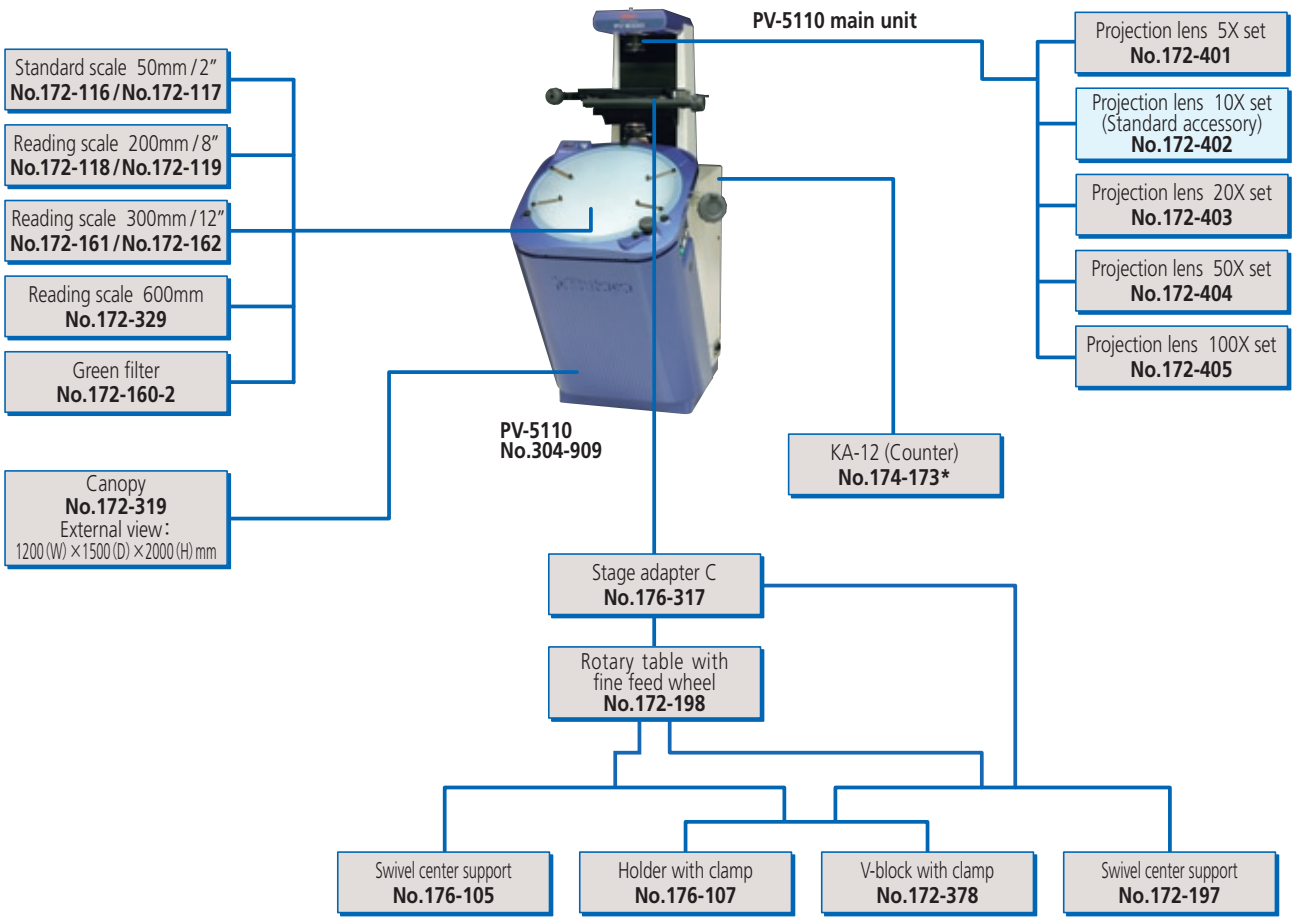
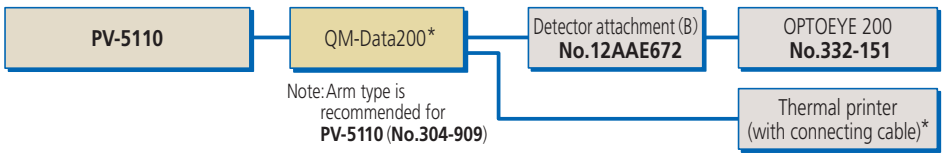
System Diagram



Note: If an optional unit is installed on the stage, the W (Working distance) length is reduced by the optional unit height.
*Order numbers differ depending on the connector form.

Data Processing System Diagram



For details, refer to the QM-Data200 and Vision Unit brochure.
*Order numbers differ depending on the connector form.

◆Lamp replacement

512305*: Long-life halogen bulb of 24V/150W

*Illuminance for Long life specification is rather low.

PH-3515F, PH-A14

Optimal for contour observation/measurement of cutting tools (end mills, lathe tools, tipped saws, etc.), screws and springs.

PH-3515F

PH-A14

Technical Data

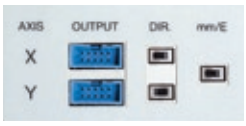
Projected image:	Erect*(PH-3515F), Inverted(PH-A14)
Protractor screen	
• Effective diameter:	353(13.9″)mm (PH-3515F), 356(14″)mm (PH-A14)
• Screen material:	Fine-ground glass
• Screen rotation:	±360°, The counter displays up to ±370°.
• Angle reading: (for PH-3515F)	Digital counter (LED) Resolution: 1′ or 0.01° (switchable) Range: ±370° ABS/INC mode switching, Zero Set
• Angle reading: (for PH-A14)	Vernier (graduation: 2′)
• Cross hairs:	90° Solid lines
Projection lens:	10X (Standard accessory)
Optional:	5X (PH-3515 only), 20X, 50X, 100X
Lens mount:	Screw mount
Magnification accuracy	
• Contour illumination:	±0.1% or less of nominal maginification
• Surface illumination:	±0.15% or less of nominal maginification
Maximum workpiece height:	Refer to the projection lenses (L_1) right.
Contour illumination	
• Light source:	Halogen bulb (24V, 150W)
• Optical system:	Telecentric
• Functions:	2-step (High/Low) brightness switch: PH-3515F, (Lit together with main power activation: PH-A14) Heat-absorbing filter, Cooling fan
Surface illumination	
• Light source:	Halogen bulb (24V 200W: PH-3515F), (24V 150W, common to the contour illumination: PH-A14)
• Optical system:	Vertical illumination
• Functions:	Adjustable condenser lens, Vertical/ Oblique surface illumination selectable: PH-3515F, (Lit together with main power activation: PH-A14) Heat-absorbing filter, Cooling fan
Focusing:	Stage part drive, Manual
Resolution for X/Y counter:	0.001mm or .0001″/0.001mm (using optional KA counter)
Power supply:	100 - 240V AC, 50/60Hz, power cord (2m)
Mass:	150kg (PH-3515F), 140kg (PH-14)
Power consumption:	Approx. 400W (PH-3515F), 200W (PH-A14)

Note1) X and Y counters are not built into the projector main unit. If a counter display is required, it is recommended that a QM-Data200 or KA-12 is purchased separately.

Note2) The indicated value of a measurement may be slightly smaller than the actual value due to optical distortion caused by the illumination conditions.

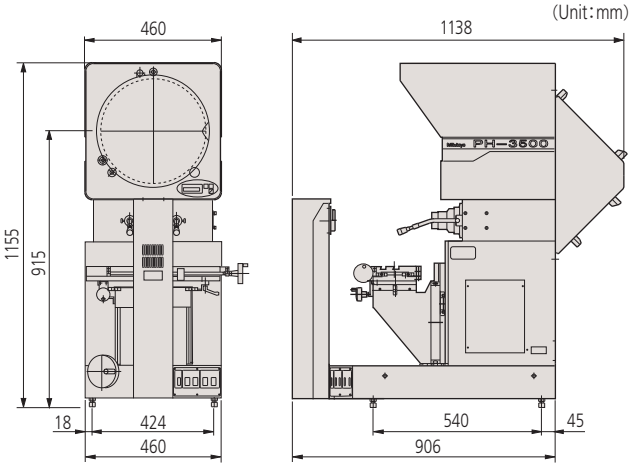
* The projected image of the workpiece is erect but inverted horizontally, which means that the vertical orientation and displacement direction of the image is the same as on the workpiece side, but the horizontal orientation and displacement direction are reversed.

Main unit side panel



Dimensions

(Unit:mm)

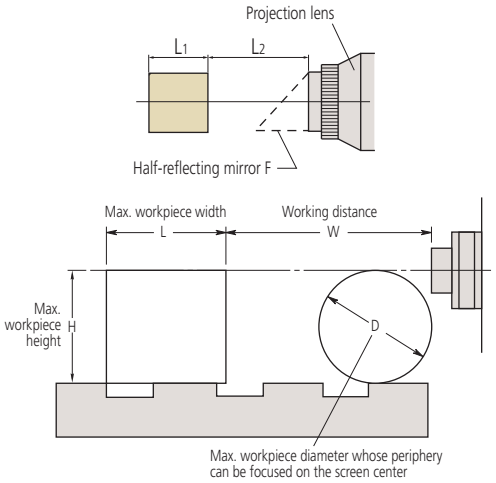


PH-3515F

*Refer to the page 13 for the dimensions of PH-A14.

To mount the optional counter (KA-12) and counter stand, approximately 300mm space is required on the right side of the main unit.

Projection lenses (10X is a standard accessory)



PH-3515F Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	70.6	35.3	17.65	7.06	3.5
L	175	235	235	80	109
W	160 (64)	93 (35)	40	14.6	9.5
D	152.4	152.4	116	30.4	19
H	152.4	152.4	152.4	152.4	152.4

( ): When using surface illumination

PH-A14 Unit: mm

	Magnification			
	10X	20X	50X	100X
View field	35.6	17.8	7.12	3.56
L	235	235	109	109
W	93	40	14.6	9.5
D	130	116	31.3	19.2
H	102	102	102	102

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System Diagram

PH-3515F, PH-A14 main unit

- Standard scale 50mm / 2″ **No.172-116 / No.172-117**
- Reading scale 200mm / 8″ **No.172-118 / No.172-119**
  Reading scale 300mm / 12″ **No.172-161 / No.172-162**
- Surface illumination unit **No.172-133** (only for PH-3515F)
- Green filter **No.172-286**
- Overlay chart set **No.12AAM027** (12 pcs.)

- Projection lens 5X set **No.172-145** (PH-3515F)
  - For half-reflection mirror F for 5X **No.172-294** (PH-3515F)
- Projection lens 10X set (Standard accessory) **No.172-184** (PH-3515F)/ **No.172-011** (PH-A14)
  - For half-reflection mirror F for 10X **No.172-295** (PH-3515F)
- Projection lens 20X set **No.172-173** (PH-3515F)/ **No.172-012** (PH-A14)
- Projection lens 50X set **No.172-165** (PH-3515F)/ **No.172-013** (PH-A14)
- Projection lens 100X set **No.172-166** (PH-3515F)/ **No.172-014** (PH-A14)

No.172-001 **No.172-002**

- Tipped-saw support stand*1 **No.172-001**
- Cutter support stand*1 **No.172-002**

*1 Mounting fixtures for tipped saws and cutters are compatible with the center hole diameter of 25.4mm.

- Counter stand **No.12AAF182**
  - KA-12 (Counter) **No.174-173***2

*2 Order numbers differ depending on the connector form.

- Vertical holder **No.172-132**
- Center support riser **No.172-143**
- Rotary vice **No.172-144**
- V-block with clamp **No.172-234**
- Center support **No.172-142**

Data Processing System Diagram

PH-3515F
PH-A14
main unit

- QM-Data200 (Arm type) **No.264-156**
  - Thermal printer (with connecting cable)*
  - Adjustable stand **No.172-270**
  - Detector attachment (A) **No.12AAE671**
    - OPTOEYE 200 **No.332-151**

For details, refer to the QM-Data200 and Vision Unit brochure.
*Order numbers differ depending on the connector form.

◆Lamp replacement

515530*1: High-luminance halogen bulb of 24V/150W

512305*2: Long-life halogen bulb of 24V/150W
(Long-life specification, Rating approx. 500 hours)

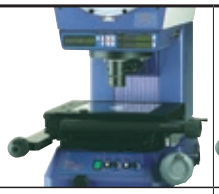
12BAA637*1: Parabolic halogen bulb 24V/200W
(for only PH-3515F)

*1 This lamp is a standard accessory.
*2 Illuminance for Long life specification is rather low.

Stage

PJ-A3000					
XY range		50×50mm	100×100mm	150×50mm	200×100mm
PJ-A3000 main unit	Model	**PJ-A3005D-50**	**PJ-A3010F-100**	**PJ-A3005F-150**	**PJ-A3010F-200**
	Order No.	**302-704***	**302-703***	**302-702***	**302-701***
Measuring unit		Digital micrometer head	Digital scale	Digital scale	Digital scale
Quick-release mechanism		—	X and Y axes	X and Y axes	X and Y axes
Top surface size		152×152mm	250×250mm	280×152mm	380×250mm
Effective size of stage glass		82×82mm	142×142mm	185×84mm	266×170mm
Stage glass thickness		5mm	5mm	6mm	6mm
Stage glass No.		**380405**	**12BAE041**	**381349**	**382762**
Swivel adjustment range		—	—	—	±3°
Maximum loading		10kg	10kg	8kg	8kg

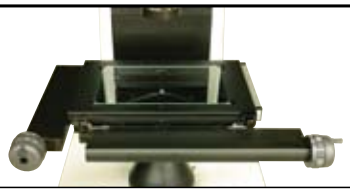
* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, -1D for CEE, -1 DC for CCC, -1E for BS, -1K for KC, C and No suffix are required for PSE.

PJ-H30					
XY range		100×100mm	200×100mm	200×170mm	300×170mm
Protractor screen	Model	**PJ-H30A1010B**	**PJ-H30A2010B**	**PJ-H30A2017B**	**PJ-H30A3017B**
	Order No.	**303-712***	**303-713***	**303-714***	**303-715***
Protractor screen/ OPTOEYE built-in/ motor-driven focusing	Model	**PJ-H30D1010B**	**PJ-H30D2010B**	**PJ-H30D2017B**	**PJ-H30D3017B**
	Order No.	**303-732***	**303-733***	**303-734***	**303-735***
Measuring unit		High-accuracy digital scale			
Quick-release mechanism		X and Y axes standard			
Top surface size		300×240mm	350×280mm	410×342mm	510×342mm
Effective size of stage glass		180×150mm	250×150mm	270×240mm	370×240mm
Stage glass thickness		6mm	6mm	8mm	8mm
Stage glass No.		**380412**	**382762**	**12BAD363**	**12BAD330**
Swivel adjustment range		±3° (right)		±5° (left)	
Maximum loading		10kg		20kg	
Measuring accuracy		(3+0.02L) μm L: Measured length (mm) The measurement method conforms to JIS B 7184.			

* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE.

Mitutoyo

PV-5110

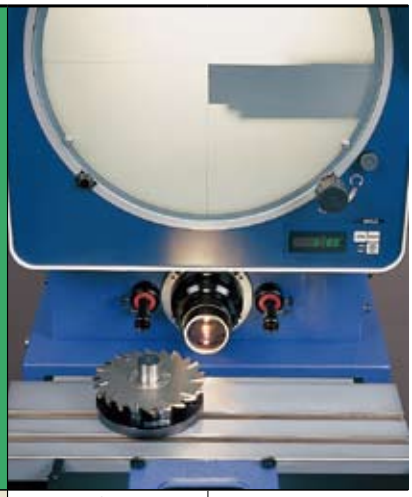


XY range	200×100mm
PV-5110 main unit Order No.	**304-919***
Measuring unit	Digital scale
Quick-release mechanism	X and Y axes
Top surface size	380×250mm
Effective size of stage glass	266×170mm
Stage glass thickness	6mm
Stage glass No.	**382762**
Swivel adjustment range	±3°
Maximum loading	5kg

* To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE.

PH-3515F PH-A14

(Picture right is PH-3515F)

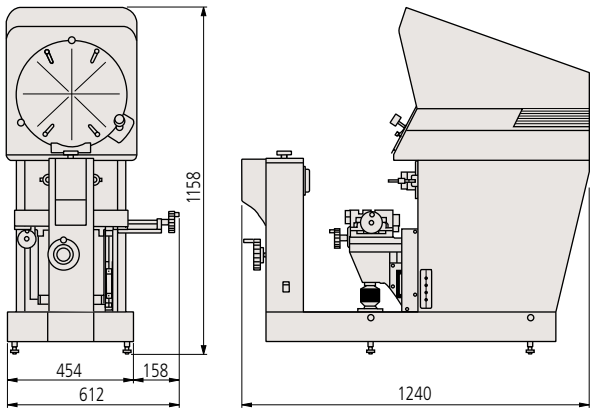


Model No.	**PH-3515F**	**PH-A14**
XY range	254×152mm	200×100mm
PH main unit Order No.	**172-868***1	**172-810***2
Measuring unit	Digital scale	
Quick-release mechanism	Only X-axis	—
Top surface size	450×146mm	407×152.4mm
Dovetail groove	Two (Pitch = 43mm)	
Minimum swivel angle reading	30′	—
Maximum measuring diameter (horizontally fixed)*3	ø340mm	ø300mm
Swivel adjustment range	±10°	—
Maximum loading	45kg	

Photo: Cutter (Outside diameter of 175mm max.) is mounted on the tipped-saw support fixture (**No.172-001**).

*1 To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, DC for CCC, E for BS, K for KC, C and No suffix are required for PSE.
*2 To denote your AC power cable add the following suffixes to the order No.: -10A for UL/CSA, -20D for CEE, -20DC for CCC, -20E for BS, -20K for KC.
*3 When using the projection lens 10X (Standard accessory) .

Dimensions of PH-A14



Accessories (Optional)

2-D Data Processing Unit QM-Data200 •Patented in Japan.

The QM-Data200 is a geometric readout/analysis unit for optical instruments such as profile projectors. This unit features powerful 2-D coordinate measurement capabilities with easy-to-use key operation. Measurement results can be visualized on the LCD display and printed out if required.

FEATURES

- High contrast color graphic displays on the large LCD screen with LCD back light.
- One-key operation for combined measurements that are often used (circle-circle distance, etc.)
- Equipped with the measurement procedure teaching function and measuring position navigation in Repeat mode.
- Easy measurement using combination of visual cross-hair alignment and automatic edge detection (Optoeye positioning function).
- The AI measurement function (automatic identification of measuring item) eliminates switching between the measurement command keys.
- The user menu function allows user to store measurement commands or part programs to create his/her own menu.
- Tolerance zone judgment of data processing result and statistical processing for each item are possible.
- Measurement result output to "MS-Excel®" in spreadsheet (CSV) format*
- The measurement procedure and measurement result can be saved, using USB memory.**
- Two models are available: a stand-alone type with tilt system and a flexible arm type that can be mounted on a Profile Projector.
- Measurement possible even during printout

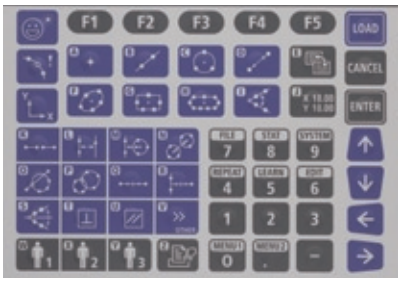
* Ms-Excel® is a registered trademark of Microsoft Corporation.
** Operation is not assured for all commercial USB memories.

Specifications

Code	QM-Data200	
Order No.	**Stand-mount type** **264-155** Note1	**Arm-mount type** **264-156** Note1
Display languages (selectable)	Japanese/English/German/French/Italian/Spanish/Portuguese/Czech/Chinese/ Korean/Turkish/Swedish/Polish/Dutch/Hungarian	
Measured value unit	Length: mm Angle: degree	
Resolution	0.1µm / degree-minute-second (selectable)	
Program functions	Part program creation, execution, editing	
Statistical processing	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram, statistics on a measuring function basis (by command)	
Display system	COLOR TFT LCD (with LED backlight)	
Edge Sensor Position Compensation	Supported (Projector)	
Input/Output	X,Y,Z: Maximum of three Linear Scales RS-232C 1: For connecting to external PC RS-232C 2: For connecting to counter of measuring instrument OPTOEYE: For inputting edge signal from OPTOEYE (OPTOEYE M2)	FS: For connecting to optional foot switch PRINTER: For connecting to optional printer USB-FD: For connecting to USB-FDD USB-MEMORY: For connecting to USB memory
Measurement result file output	RS-232C output (CSV format, MUX-10 format)	
Power	AC100 - 240V	
Maximum power consumption	17W (does not include optional accessories)	
External dimensions (WxDxH)	Approximately 260×242×310 (including the stand)	Approximately 318×153×275mm (when the arm is in the horizontal posture)
Mass	Approximately 2.9kg	Approximately 2.8kg
Applicable models	**PJ2500/PJ-3000 Series PJ-H3000 Series, PV600A PH-3515F(No.172-847-5)**	**PJ-2500/PJ-3000 Series PJ-A3000 Series, PJ-H30, PV-5110 PH-3515F (No.172-949), PH-A14**
Standard accessories	AC adapter, power cable, Easy operation guide	

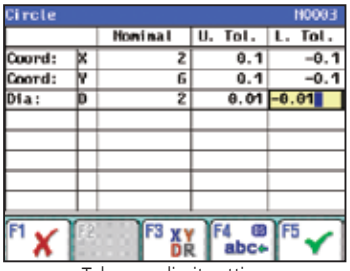
Note1: To denote your AC power cable add the following suffixes to the order No.: A for UL/CSA, D for CEE, 00 for CCC (power cord for CCC and User's Manual set of Simplified Chinese are provided for separately), E for BS, K for KC, C and No suffix are required for PSE.
Note2: Refer to the QM-Data200 and Vision Unit leaflet (E14008) for more details.

Operation panel

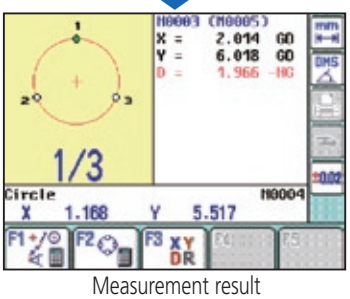


Operation screen (tolerance zone measurement)

Tolerance zone measurement result can be checked by color display at a glance.



Tolerance limit setting



Measurement result

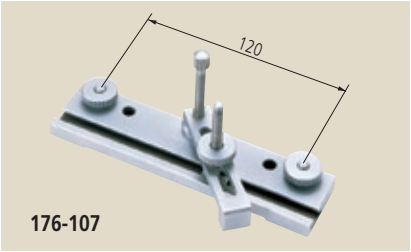
Mitutoyo

■Rotary tables

Order No.		176-106	172-198	176-305	176-306
Product Name		Rotary table	Rotary table with fine feed wheel	Rotary table with fine feed wheel A	Rotary table with fine feed wheel B
Rotary stage size		ø112mm	ø146mm	ø240mm	ø270mm
Fine adjustment		—	✓	✓	✓
Effective glass diameter		ø60mm	ø96mm	ø182mm	ø238mm
Minimum angle reading		6′	2′	—	—
External dimensions (WxDxH)mm		152x152x21.5	240x172x19.7	280x280x23.7	342x342x23.2
Mass		1.7kg	2.4kg	5.5kg	6.5kg
Applicable models	**PJ-A3000**	✓	✓	—	—
	PJ-H30	—	✓	✓	✓
	PV-5110	—	✓	—	—

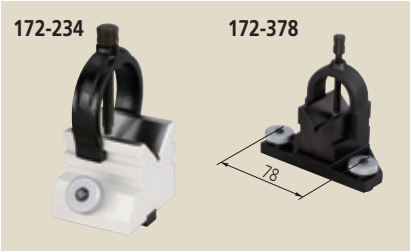
Note: Rotary table with fine feed wheel (rotary stage size of ø315mm and effective glass diameter of ø280mm) is provided.

■Holder with clamp



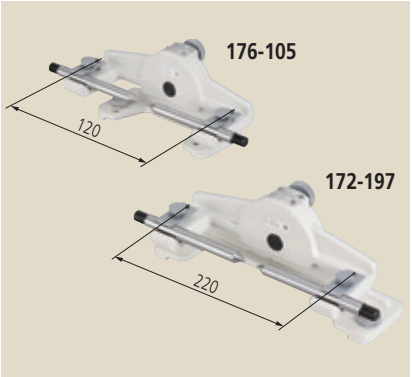
Order No.	176-107
Applicable models	**PJ-A3000** Series **PJ-H30** Series **PV-5110**
Maximum width to be clamped	0 - 35mm
Mass	0.4kg

■V-block with clamp



Order No.	172-234	172-378
Applicable models	**PH-3515F** **PH-A14**	**PJ-A3000** Series **PJ-H30** Series **PV-5110**
Maximum workpiece diameter to be clamped	ø50mm	ø25mm
Central height from a mounting surface	38 - 48mm	38 - 48mm
Mass	1.24kg	0.8kg

■Swivel center support



Order No.	176-105	172-197
Maximum workpiece size to be clamped*	ø70mm (45x140mm)	ø80mm (65x140mm)
Inclination	±10°	±10°
Mass	2.4kg	2.5kg

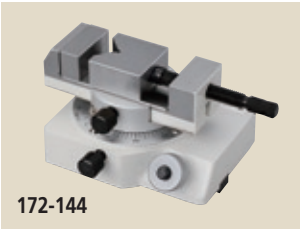
*The maximum possible size to be measured differs depending on the projection magnification selected. The size enclosed in parentheses ( ) indicates that for an inclination of 10°

■Adapter

Order No.		176-304	176-317
Product Name		Stage adapter	Stage adapter (C)
External dimensions (WxDxH)mm		50x340x15	73x278x17
Mass		1.5kg	1.8kg
Applicable models	**PJ-A3000**	—	✓
	PJ-H30	✓	✓
	PV-5110	—	✓

Accessories (Optional)

■Rotary vise



172-144

Order No.	172-144
Applicable models	PH-3515F PH-A14
Rotation range	360°
Size between mounting surface and top surface	76mm
Minimum angle reading	5'
Mass	2.8kg

■Center support

172-142

Order No.	172-142
Applicable models	PH-3515F PH-A14
Maximum workpiece diameter to be clamped	120mm (240mm)*
Mass	3.3kg

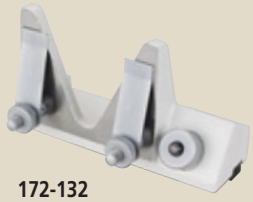
*When center support riser (**No.172-143**) is used.

■Center support riser

172-143

Order No.	172-143
Applicable models	PH-3515F PH-A14
Height	60mm
Mass	2.2kg

■Vertical holder



172-132

Order No.	172-132
Applicable models	PH-3515F PH-A14
Glass size	—
Mass	1.3kg

■Standard scale

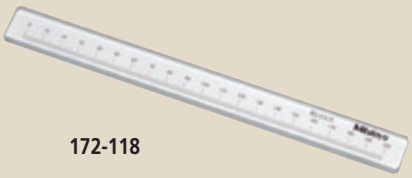
Glass scale used for checking magnification accuracy

172-116

Order No.	172-116	172-330	172-117
Range	50mm	80mm	2″
Graduation	0.1mm		.01″
Accuracy (20°C)	(3+5L/1000) μm L=Measured length (mm)		(120+5L)×10^{-6}″ L=Measured length (inch)

■Reading scale

Glass scale specially designed for inspecting the magnified image of a standard scale on the projection screen



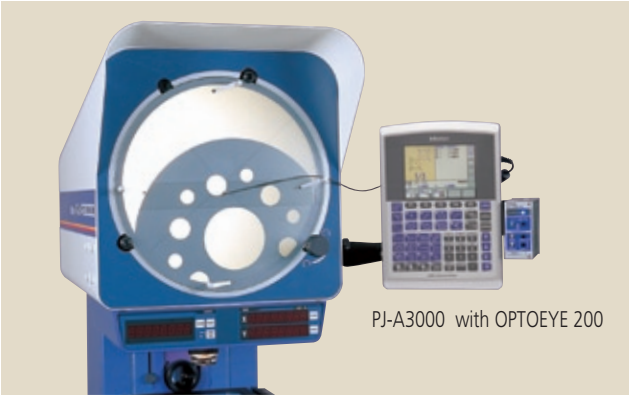
172-118

Order No.	172-118	172-161	172-329
Range	200mm	300mm	600mm
Graduation	0.5mm		
Accuracy (20°C)	(15+15L/1000) μm L=Measured length (mm)		

Order No.	172-119	172-162
Range	8″	12″
Graduation	.02″	
Accuracy (20°C)	(600+15L)×10^{-6}″ L=Measured length (inch)	

Mitutoyo

■OPTOEYE (Projected image position detecting device)



PJ-A3000 with OPTOEYE 200

OPTOEYE 200 and detector mounting plate A

- An edge detecting device for improving the measuring efficiency and reliability of a profile projector by removing the need to position the cross hairs on an edge manually. This has the effect of eliminating the operator variability factor from data entry and shortening the measurement time.
- The detector uses an optical fiber that can be easily fixed on the screen with chart clips.
- The device is provided with an error detection function that works if the screen light intensity changes.
- This device can be retrofitted onto the QM-Data200 and does not need an AC adapter since power is supplied from the QM-Data200 through the connecting cable.
- The X and Y-axis linear scales on the projector main unit are directly connected to the QM-Data200 during use of the Optoeye system.
- This system can be used in combination with the QM-Data200 but is only available for the PJ-H30A. (PJ-H30D does not need this system because it has a built-in Optoeye sensor.)

Order No.	**332-151**
Model	**OPT-200**
Illumination	Contour/surface*
Detecting directivity	Non direction
Minimum detectable circle	ø2mm
Minimum detectable line width	1mm
Maximum response speed	1000mm/s
Illumination range (Bright)	30 - 1500ℓX
Bright-Dark field difference	20ℓX or higher
Repeatability (contour illumination)	σ=1μm*

* Mitutoyo's condition

Configuration of standard accessories
Electronic unit
Detector: Optical fiber
Connecting cable: For connecting electrical component main unit and QM-Data200
Fixture for QM-Data200 (**No.12BAG139**) : For fixing the electrical component main unit to QM-Data200

Note) Detector mounting plate is an optional accessory.

■Built-in OPTOEYE (only PJ-H30D)

PJ-H30D	Detecting sensor: Built in center of screen, non-directional Illumination*, Minimum detectable circle: ø2mm (projected image size), Minimum line width: 1mm (projected image size), Repeatability: σ=1μm**

*Mitutoyo's condition **Mitutoyo test condition

■Thermal printer DPU-414

Order No.	Connected to QM-Data200	*Order numbers differ depending on the connector form.
	Counter/angle display value printout*	*Order numbers differ depending on the connector form.
Print method		Dot-matrix thermosensitive method
Number of print digits		40 digits (normal character 9x7 dot-matrix)
Printing speed		Maximum 52.5 characters/sec (normal character)
External dimensions		160(W)x170(D)x65.5(H)mm (Printer main unit)
Standard accessories		Printer cable, printer paper (1 roll), AC adapter (for 100VAC)
Printer paper		**No.908353** (5 rolls)

* Counter/angle display value printout is for PJ-3000 series and PJ-H30 series.

■Adjustable stand

For QM-Data200 (stand-type specification), thermal printer, etc.

Order No.	**172-270**
Platform position	Adjustable to a height of 720 to 1020mm
Platform size	600x450mm

■Machine stand

Order No.	**172-269**
External dimensions	500(W)x830(D)x650(H)mm

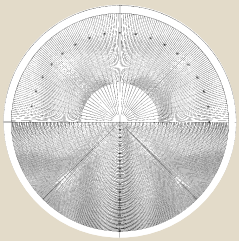
*Recommended for PJ-A3000 series

Accessories (Optional)

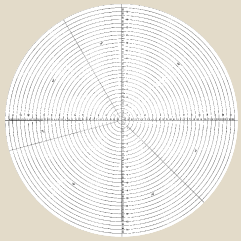
■Overlay charts

To quickly check an image projected on the screen, an appropriate chart is used. 12 types of overlay charts are available according to the application.

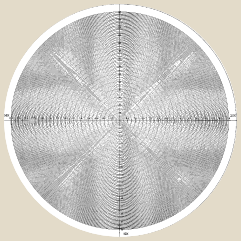
Overlay chart No.11



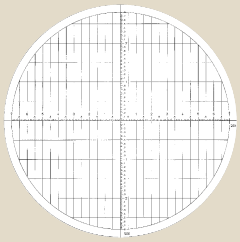
Overlay chart No.12



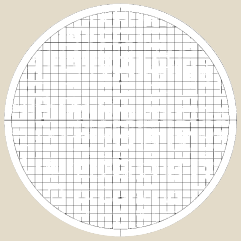
Overlay chart No.13



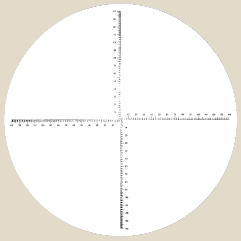
Overlay chart No.14



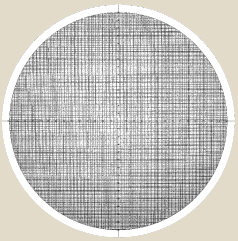
Overlay chart No.15



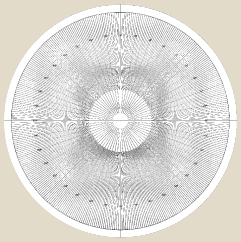
Overlay chart No.16



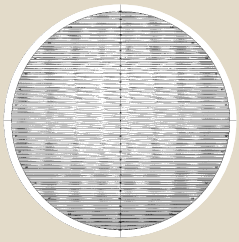
Overlay chart No.17



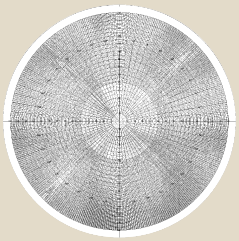
Overlay chart No.18



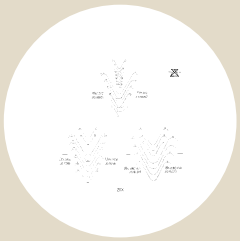
Overlay chart No.19

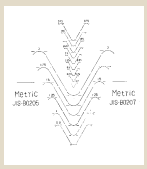


Overlay chart No.20

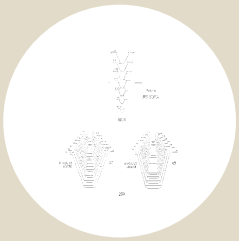


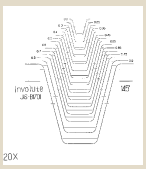
Overlay chart No.21





Overlay chart No.22





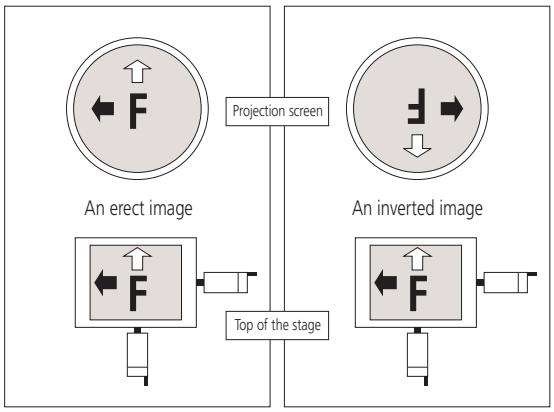
Product name	Order No.	Specification
Overlay charts Set of 12	**12AAM027**	Set of 12 charts (Overlay charts No.11 – No.22)
Overlay chart No.11	**12AAM587**	Upper side: radial lines (at intervals of 1°) Lower side: concentric circles (at intervals of 1mm in radius)
Overlay chart No.12	**12AAM588**	Concentric circles (at intervals of 5mm in radius) with cross hairs (1mm graduation)
Overlay chart No.13	**12AAM589**	Concentric circles (at intervals of 1mm in radius) with cross hairs
Overlay chart No.14	**12AAM590**	Horizontal: Parallel lines at intervals of 50mm (50-times enlargement of 1mm) Vertical: Parallel lines at intervals of 20mm (20-times enlargement of 1mm)
Overlay chart No.15	**12AAM591**	10mm-interval grids
Overlay chart No.16	**12AAM592**	Cross hairs (0.5mm graduation)

Product name	Order No.	Specification
Overlay chart No.17	**12AAM593**	1mm-interval grids
Overlay chart No.18	**12AAM594**	1°-interval radial lines
Overlay chart No.19	**12AAM595**	Horizontal: 1mm-interval parallel lines
Overlay chart No.20	**12AAM596**	Concentric circles (at intervals of 1mm in radius) and radial lines (at intervals of 1°)
Overlay chart No.21	**12AAM597**	Metric screw for 20X lens: P = 0.2 to 2mm Unified screw: 28 to 12 threads/inch Whitworth screw: 20 to 10 threads/inch
Overlay chart No.22	**12AAM598**	Metric screw for 100X lens: P = 0.08 to 0.25mm Involute tooth profile for 20X lens (reference rack tooth profile) 20°pressure angle: 0.2 to 1 14.5°pressure angle: 0.2 to 1

Quick guide to Profile Projectors

Erect Image and Inverted Image

An image of an object projected onto a screen is erect if it is orientated the same way as the object on the stage. If the image is reversed top to bottom, left to right and by movement with respect to the object on the stage (as shown in the figure below) it is referred to as an inverted image (also known as a reversed image, which is probably more accurate).



F Workpiece
X-axis movement
Y-axis movement

Magnification Accuracy

The magnification accuracy of a projector when using a certain lens is established by projecting an image of a reference object and comparing the size of the image of this object, as measured on the screen, with the expected size (calculated from the lens magnification, as marked) to produce a percentage magnification accuracy figure, as illustrated below. The reference object is often in the form of a small, graduated glass scale called a `stage micrometer' or `standard scale', and the projected image of this is measured with a larger glass scale known as a `reading scale'.
(Note that magnification accuracy is not the same as measuring accuracy.)

$$\Delta M(\%) = \frac{L - \ell M}{\ell M} \times 100$$

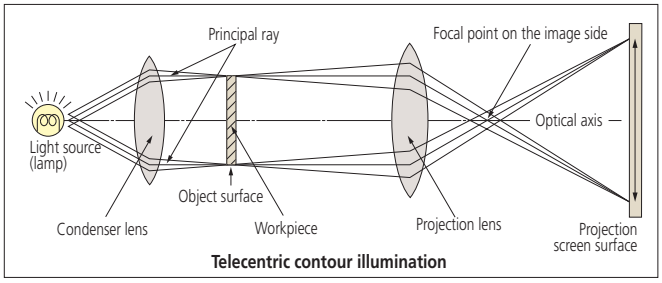
ΔM(%): Magnification accuracy expressed as a percentage of the nominal lens magnification
L : Length of the projected image of the reference object measured on the screen
ℓ : Length of the reference object
M : Magnification of the projection lens

Type of Illumination

- Contour illumination: An illumination method to observe a workpiece by transmitted light and is used mainly for measuring the magnified contour image of a workpiece.
- Coaxial surface illumination: An illumination method whereby a workpiece is illuminated by light transmitted coaxially to the lens for the observation/measurement of the surface. (A half-mirror or a projection lens with a built-in half-mirror is needed.)
- Oblique surface illumination: A method of illumination by obliquely illuminating the workpiece surface. This method provides an image of enhanced contrast, allowing it to be observed three-dimensionally and clearly. However, note that an error is apt to occur in dimensional measurement with this method of illumination. (An oblique mirror is needed. Models in the PJ-H30 series are supplied with an oblique mirror.)

Telecentric Optical System

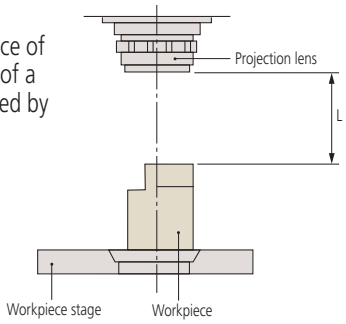
An optical system based on the principle that the principal ray is aligned parallel to the optical axis by placing a lens stop on the focal point on the image side. Its functional feature is that the image will not vary in size though the image blurs as the object is shifted along the optical axis. For measuring projectors and measuring microscopes, an identical effect is obtained by placing a lamp filament at the focal point of a condenser lens instead of a lens stop so that the object is illuminated with parallel beams. (See the figure below.)



Telecentric contour illumination

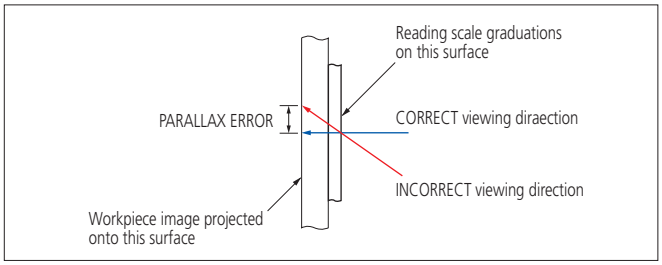
Working distance

Refers to the distance from the face of the projection lens to the surface of a workpiece in focus. It is represented by L in the diagram below.



Parallax error

When a reading scale is used to measure the size of a workpiece feature there is always a certain distance between the reading scale, which is laid on the top of the stage glass, and the projected image of the feature which is on the underneath surface. Unless the reading scale is always viewed from the same direction, ideally from directly above, the image will appear to shift against the reading scale graduations and thus cause a measurement error.

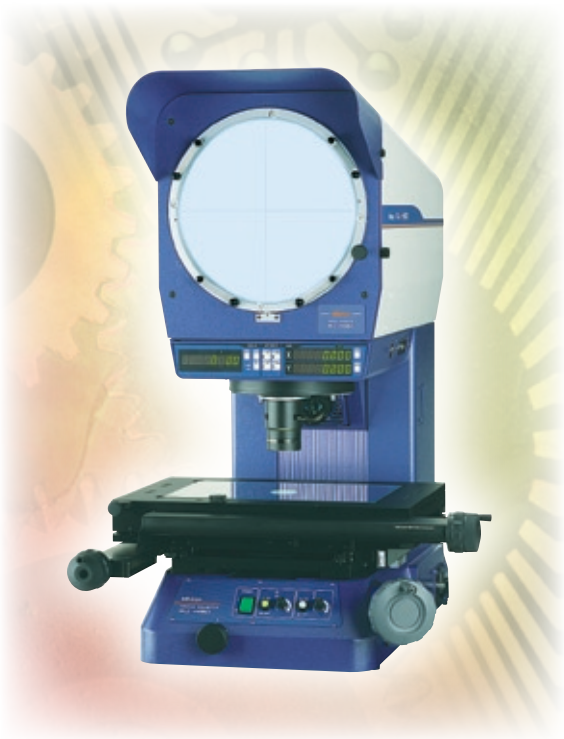


Field of view diameter

The maximum diameter of workpiece that can be projected using a particular lens.

$$\text{Field of view diameter (mm)} = \frac{\text{Screen diameter of profile projector}}{\text{Magnification of projection lens used}}$$

Example: If a 5X magnification lens is used for a projector with a screen of ø500mm:
Field of view diameter is given by $\frac{500\text{mm}}{5} = 100\text{mm}$



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